Memorandum

MIAMI-DADE COUNTY

Date: September 14, 2005

IRCA
Agenda Item
No. 5(G)

To: Honorable Sally A. Heyman, Chairperson and Members, Intergovernmental, Recreation and Cultural Affairs Committee

From: George M. Burgess
County Manager

Subject: Petting Zoo Guidelines Utilized by the Park and Recreation Department

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During the April 19, 2005 Board of County Commissioners meeting, the Park and Recreation Department was requested to provide information on the guidelines utilized for petting zoos within the appropriate health standards and to submit these guidelines to the appropriate committee for review.

Miami-Dade County uses the attached recommended guidelines established by the Department of Health and Human Services Centers for Disease Control and Prevention with regards to petting zoos. These guidelines provide standardized recommendations for public health officials, veterinarians, animal venue operators, animal exhibitors, visitors to animal venues and exhibits, and others concerned with disease-control and with minimizing risks associated with animals in public settings. The guidelines are updated annually and issued in the Centers for Disease Control and Prevention's Morbidity and Mortality Weekly Report (MMWR) Series. The Park and Recreation Department is an electronic subscriber of the Centers for Disease Control and Prevention and receives all updates.

Attachment

Alex Munoz
Assistant County Manager

MMWR

Recommendations and Reports

March 25, 2005 / 54(RR04);1-12

Compendium of Measures To Prevent Disease Associated with Animals in Public Settings, 2005

National Association of State Public Health Veterinarians, Inc. (NASPHV)

Prepared by
NASPHV

This report has been endorsed by CDC, the Council of State and Territorial Epidemiologists, and the American Veterinary Medical Association.

The material in this report originated in the National Center for Infectious Diseases, Anne Schuchat, MD, Director; and the Division of Bacterial and Mycotic Diseases, Judith R. Aguilar, Acting Director.

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Disclosure of Relationship: CDC, the National Association of State Public Health Veterinarians (NASPHV), our planners, and our content professionals have disclosed that they have no financial interests or other relationships with the manufactures of commercial products, suppliers of commercial services, or commercial supporters. This report does not include any discussion of the unlabeled use of a product or a product under investigational use.

Summary

Multiple venues encourage or permit the public to come in contact with animals, resulting in millions of human-animal contacts each year. These settings include county or state fairs, petting zoos, animal swap meets, pet stores, zoologic institutions, circuses, carnivals, farm tours, livestock-birthing exhibits, educational exhibits at schools, and wildlife photo opportunities. Although multiple benefits of human-animal contact exist, infectious diseases, rabies exposures, injuries, and other human health problems associated with these settings are of concern. Rabid or potentially rabid animals in public settings can result in extensive public health investigation and action. Infectious disease outbreaks reported during the previous decade have been attributed to multiple organisms, including Escherichia coli *O157:H7,* Salmonella, Coxiella burnetti, Mycobacterium tuberculosis, *and ringworm. Such incidents have substantial medical, public health, legal, and economic effects.*

This report provides standardized recommendations for public health officials, veterinarians, animal venue operators, animal exhibitors, visitors to animal venues and exhibits, and others concerned with disease-control and with minimizing risks associated with animals in public settings. The recommendation to wash hands is the single most important prevention step for reducing the risk for disease transmission. Other critical recommendations are that venues include transition areas between animal areas and nonanimal areas (where food is sold) and that

animals are properly cared for and managed in public settings. In addition, this report recommends educating venue operators, staff, exhibitors, and visitors regarding the risk for disease transmission where animal contact is possible.

Introduction

Contact with animals in public settings (e.g., fairs, farm tours, and petting zoos) provides opportunities for entertainment and education concerning animals and animal husbandry. However, inadequate understanding of disease transmission and animal behavior can lead to infectious diseases, rabies exposures, injuries, and other health problems among visitors, especially children, in these settings. Diseases called zoonoses or zoonotic diseases can be transmitted from animals to humans. Of particular concern are situations in which substantial numbers of persons are exposed to zoonotic disease or become ill, necessitating public health investigation and medical follow-up. A 2004 review identified >25 human infectious disease outbreaks during 1990--2000 associated with visitors to animal exhibits (*1*).

The National Association of State Public Health Veterinarians (NASPHV) recognizes the positive benefits of human-animal contact. NASPHV considers that the risks of these contacts can be minimized in properly supervised and managed settings by using appropriately selected animals that receive regular health examinations and preventive care. Although eliminating all risk from animal contacts might not be achievable, this report provides standardized recommendations for minimizing disease and injury.

NASPHV recommends that local and state public health, agricultural, environmental, and wildlife agencies, and other organizations use these recommendations to establish their own guidelines or regulations for reducing the risk for disease from human-animal contact in public settings. Multiple venues exist where public contact with animals is permitted (e.g., animal displays, petting zoos, animal swap meets, pet stores, zoologic institutions, nature parks, circuses, carnivals, farm tours, livestock-birthing exhibits, county or state fairs, schools, and wildlife photo opportunities). Persons responsible for managing these venues are encouraged to use the information in this report to reduce risk.

Guidelines to reduce risks for disease from animals in health-care facilities and service animals (e.g., guide dogs) have been developed (*2--4*). These settings are not specifically addressed in this report, although the general principles and recommendations might be applicable.

Enteric (Intestinal) Diseases

Infections with enteric bacteria and parasites pose the highest risk for human disease from animals in public settings (*5*). Healthy animals harbor multiple human enteric pathogens. Certain organisms have a low infectious dose (*6--8*). Because of the popularity of animal venues, a substantial number of persons might be exposed to these organisms. Reports of illness and outbreaks among visitors to fairs, farms, and petting zoos have been documented. Pathogens linked to outbreaks include *Escherichia coli* O157:H7, *Campylobacter*, *Salmonella*, and *Cryptosporidium* (*9--17*). Although these reports usually document cattle, sheep, and goats as sources for infection, poultry (*18--21*) and other domestic and wild animals also are potential sources.

The primary mode of transmission for enteric pathogens is the fecal-oral route. Because animal fur, hair, skin, and saliva (*22*) can become contaminated with fecal organisms, transmission might occur when persons pet, touch, or are licked by animals. Transmission has also occurred from fecal contamination of food, including raw milk (*23--25*), sticky foods (e.g., cotton candy [*26*]), water (*27--29*), and environmental surfaces (*12,18,30,31*).

Animals infected with enteric pathogens (e.g., *E. coli* O157:H7, *Salmonella*, and *Campylobacter*) frequently exhibit no signs of illness and might shed pathogens intermittently. Therefore, although removing ill animals (especially

those with diarrhea) is necessary to protect animal and human health, it is not sufficient: animals that appear to be healthy might still be infectious and contaminate the environment. Certain organisms live months or years in the environment (*32--36*). Because of intermittent shedding and limitations of laboratory tests, culturing fecal specimens or other attempts to identify, screen, and remove infected animals might not be effective in eliminating the risk for transmission. Antimicrobial treatment of animals cannot be depended upon to eliminate infection and shedding of enteric pathogens or to prevent reinfection.

Multiple factors increase the probability of transmission at animal exhibits. Animals are more likely to shed pathogens because of stress induced by prolonged transportation, confinement, crowding, and increased contact with persons (*37--43*). Commingled animals increase the probability that animals shedding organisms will infect other animals. The prevalence of certain enteric pathogens might be higher in young animals (*44--46*), which are frequently exhibited by petting zoos. Shedding of *E. coli* O157:H7 and *Salmonella* is highest in the summer and fall when substantial numbers of traveling animal exhibits, agricultural fairs, and petting zoos are scheduled (*43,47,48*).

The risk for infections or outbreaks is increased by certain human factors and behaviors. These factors include inadequate hand washing, venues that attract substantial numbers of children, a lack of close supervision of children, hand-to-mouth activities (e.g., use of pacifiers, thumb-sucking, smoking, and eating) in proximity to animals, and a lack of awareness of the risk.

The layout and maintenance of facilities and animal exhibits can also contribute to the risk for infection. Risk factors include inadequate hand-washing facilities (*1*), structural deficiencies associated with temporary food-service facilities, inadequate separation between animal exhibits and food-consumption areas (*49*), and contaminated or inadequately maintained drinking water and sewage/manure disposal systems (*27-- 29,31*).

Lessons from Outbreaks

Two *E. coli* O157:H7 outbreaks in Pennsylvania and Washington State led to CDC establishing recommendations for enteric disease prevention in animal contact settings (http://www.cdc.gov/foodborneoutbreaks/pulication/recomm_farm_animal.htm). Findings in both outbreaks were animal contact at farms open to the public and inadequate hand washing (*14,16*). In the Pennsylvania outbreak, 51 persons (median age: 4 years) became ill within 10 days of visiting a dairy farm, and eight (16%) developed hemolytic uremic syndrome (HUS), a potentially fatal consequence of *E. coli* O157:H7 infection. The same strain of *E. coli* O157:H7 was isolated from cattle, case-patients, and the farm environment. In addition to the reported cases, an increased number of diarrhea cases in the community were attributed to visiting the farm. An assessment of the farm environment determined that 1) no areas existed for eating and drinking that were separate from the animal contact areas, and 2) the limited hand-washing facilities were not configured for children (*14*).

Failure to properly wash hands was also a contributing factor in other outbreaks caused by *Cryptosporidium* (*11*) and *Salmonella* (*12*). The protective effect of hand washing and the persistence of organisms in the environment were demonstrated in an outbreak of *Salmonella* infections at a Colorado zoo. Sixty-five cases (the majority of them children) were associated with touching a wooden barrier around the Komodo dragon exhibit. Noninfected children were substantially more likely to have washed their hands after visiting the exhibit. *Salmonella* was isolated from 39 case-patients, a Komodo dragon, and the wooden barrier (*12*).

During 2000--2001 at a Minnesota children's farm day camp, washing hands with soap after touching a calf and washing hands before going home were protective factors in two outbreaks involving multiple enteric organisms (*50*). A total of 84 illnesses were documented among attendees. Implicated organisms for the human infections were *E. coli* O157:H7, *Cryptosporidium parvum*, non-O157 Shiga toxin-producing *E. coli* (STEC), *Salmonella enterica* serotype Typhimurium, and *Campylobacter jejuni*. These organisms, as well as *Giardia*, were also isolated from the calves. Risk factors for children included caring for an ill calf and getting visible manure on their hands.

Enteric pathogens can contaminate and persist in animal housing areas. For example, *E. coli* O157:H7 can survive in soil for months (*31,32,34,51*). Prolonged environmental persistence of pathogens was documented in an Ohio outbreak of *E. coli* O157 infections in which 23 persons became ill at a fair after handling sawdust, attending a dance, or eating and drinking in a building where animals were exhibited during the previous week (*31*). Fourteen weeks after the fair ended, *E. coli* O157 was isolated from multiple environmental sources within the building, including sawdust on the floor and dust on the rafters. Forty-two weeks after the fair ended, *E. coli* O157 was recovered from sawdust on the floor.

Transmission of *E. coli* O157:H7 from airborne dust was implicated in an Oregon county fair outbreak with 60 cases, the majority of them children (*18*). Illness was associated with visiting an exhibition hall that housed goats, sheep, pigs, rabbits, and poultry but was not associated with touching animals or their pens, eating, or inadequate hand washing. The same organism was recovered from ill persons and the building. In 2004, an outbreak of *E. coli* O157:H7 infection was associated with attendance at a goat and sheep petting zoo at the North Carolina State Fair (*51*). Health officials investigated 112 case-patients, including 15 who had HUS. The same strain of *E. coli* O157:H7 infecting case-patients was isolated from the animal bedding 10 days after the fair was over. The strain was also isolated from the soil after the animal bedding was removed.

The effect of improper facility design was illustrated by one of the most substantial waterborne outbreaks in the United States (*28,29*). Approximately 800 suspected cases of *E. coli* O157:H7 and *Campylobacter* were identified among attendees at a New York county fair where the water and sewage systems had deficiencies.

Sporadic Infections

Multiple sporadic infections, not identified as part of recognized outbreaks, have been associated with animal environments. A study of sporadic *E. coli* O157:H7 infections among selected U.S. states and counties determined that case-patients, especially children, were more likely to have visited a farm with cows than healthy persons (*52*). Additional studies also documented an association between *E. coli* O157:H7 infection and visiting a farm (*53*) or living in a rural area (*54*). Studies of human cryptosporidiosis have documented contact with cattle or visiting farms as risk factors for infection (*55--57*). A case-control study identified multiple factors associated with *Campylobacter* infection, including raw milk consumption and contact with farm animals (*58*). In other studies, farm residents were at a lower risk for infection with *Cryptosporidium* (*55*) and *E. coli* O157:H7 (*59*) than farm visitors, probably because the residents had acquired immunity to the infection as a result of their early and frequent exposure to these organisms.

Additional Health Concerns

Although enteric diseases are the most commonly reported health risks associated with animals in public settings, multiple other health risks are of concern. For example, allergies can be associated with animal dander, scales, fur, feathers, body wastes (urine), and saliva (*60--62*). Additional health concerns addressed in this report include injuries, rabies exposures, and other infections.

Injuries

Injuries associated with animals in public settings include bites, kicks, falls, scratches, stings, crushing of the hands or feet, and being pinned between the animal and a fixed object. These injuries have been associated with multiple species, including big cats (e.g., tigers), monkeys, domestic animals, and zoo animals. The settings have included public stables, petting zoos, traveling photo opportunities, schools, children's parties, and animal rides.*

Rabies Exposures

Contact with mammals might expose persons to rabies through contamination of mucous membranes, bites, scratches, or other wounds with infected saliva or nervous tissue. Although no human rabies deaths caused by animal contact in public exhibits have been recorded, multiple rabies exposures have occurred, requiring extensive public health investigation and medical follow-up. For example, in the previous decade, thousands of persons have received rabies postexposure prophylaxis (PEP) after being exposed to rabid or potentially rabid animal species (including cats, goats, bears, sheep, ponies, and dogs) at 1) a pet store in New Hampshire (*63*), 2) a county fair in New York State (*64*), 3) petting zoos in Iowa (*65,66*) and Texas (J.H. Wright, DVM, Texas Department of Health, personal communication, 2004), and 4) school and rodeo events in Wyoming (*1*). Substantial public health and medical care challenges associated with potential mass rabies exposures include difficulty in identifying and contacting persons, correctly assessing exposure risks, and providing timely medical treatment. Prompt assessment and treatment are critical for this disease, which is usually fatal.

Other Infections

Multiple bacterial, viral, fungal, and parasitic agents have been associated with animal contact. These organisms are transmitted through various modes. Infections from animal bites are common and frequently require extensive treatment or hospitalization. Bacterial pathogens that are frequently associated with animal bites include *Pasteurella*, *Staphylococcus*, *Streptococcus*, *Capnocytophaga canimorsus*, *Bartonella henselae* (cat-scratch disease), and *Streptobacillus moniliformis* (rat-bite fever). Certain monkey species (especially macaques) that are kept as pets or used in public exhibitions can be infected with herpes B virus, either asymptomatically or with mild oral lesions. Human exposure through bites or fluids can result in a fatal meningoencephalitis (*67,68*). Because of difficulties with laboratory testing to confirm monkey infection and high herpes B prevalence, monkey bites can require intensive public health and medical follow-up.

Skin contact with animals in public settings might also result in human infection. Fifteen cases of ringworm infection (club lamb fungus) caused by *Trichophyton* species and *Microsporum gypseum* were documented among owners and family members who exhibited lambs in Georgia during a show season (*69*). Ringworm infection in 23 persons and multiple animal species were traced to a *Microsporum canis* infection in a hand-reared zoo tiger cub (*70*). Orf virus infections (contagious ecthyma or sore mouth) have occurred in goats and sheep at a children's petting zoo (*71*) and in a lamb used for an Easter photo opportunity (M. Eidson, DVM, New York State Department of Health, personal communication, 2003). After handling various species of infected exotic animals, a zoo attendant experienced an extensive papular skin rash from a cowpox-like virus (*72*). In 2003, multiple cases of monkeypox occurred among persons who had had contact with infected prairie dogs either at a child care center (*73,74*) or a pet store (J.J. Kazmierczak, DVM, Wisconsin Department of Health and Family Services, personal communication, 2004).

Ecto- and endoparasites pose concerns when humans and exhibit animals interact. *Sarcoptes scabiei* is a skin mite that infests humans and animals, including swine, dogs, cats, foxes, cattle, and coyotes (*75,76*). Although human infestation from animal sources is usually self-limiting, skin irritation and itching might occur for multiple days and be difficult to diagnose (*75--77*). Animal fleas bite humans, which increases the risk for infection or allergic reaction. In addition, fleas are the intermediate host for a tapeworm species that can infect children. Multiple other animal helminths might infect humans through fecal-oral contact or through contact with animals or contaminated earth (*78,79*). Parasite-control through veterinary care and proper husbandry coupled with hand washing reduce the risks associated with ecto- and endoparasites (*80*).

Tuberculosis (TB) is another disease of concern in certain animal settings. Twelve circus elephant handlers at an exotic animal farm in Illinois were infected with *Mycobacterium tuberculosis*, and one handler had signs consistent with active disease after three elephants died of TB. Medical history and testing of the handlers indicated that the elephants had been a probable source of exposure for the majority of the human infections (*81*). At a zoo in Louisiana, seven animal handlers who were previously negative for TB tested positive after a *Mycobacterium bovis* outbreak in rhinoceroses and monkeys (*82*). The U.S. Department of Agriculture (USDA) developed guidelines

regarding removal of infected animals from public contact as a result of concerns regarding the risk for exposure to the public (*83*).

Zoonotic pathogens might also be transmitted by direct or indirect contact with reproductive fluids, aborted fetuses, or newborns from infected dams. Live-birthing exhibits, usually involving livestock (e.g., cattle, pigs, goats, or sheep), are popular at agricultural fairs. Although the public usually does not have direct contact with animals during birthing, newborns and their dams are frequently available for petting and observation afterward. Q fever (*Coxiella burnetii*), leptospirosis, listeriosis, brucellosis, and chlamydiosis are serious zoonoses that can be associated with contact with reproductive materials (*84*).

C. burnetii is a rickettsial organism that most frequently infects cattle, sheep, and goats. The disease can cause abortion in animals, but more frequently the infection is asymptomatic. During parturition, infected animals shed substantial numbers of organisms that might become aerosolized. The majority of persons exposed to *C. burnetii* develop an asymptomatic infection, but clinical illness can range from an acute influenza-like illness to life-threatening endocarditis. A Q fever outbreak involving 95 confirmed case-patients and 41 hospitalizations was linked to goats and sheep giving birth at petting zoos. These petting zoos were in indoor shopping malls, indicating that indoor-birthing exhibits might pose an increased risk for Q fever transmission (*85*).

Chlamydophila psittaci infections cause respiratory disease (commonly called psittacosis) and are usually acquired from psittacine birds (*86*). For example, an outbreak of *C. psittaci* pneumonia occurred among the staff at the Copenhagen Denmark Zoo (*87*). On limited occasions, chlamydial infections acquired from sheep, goats, and birds result in reproductive problems in humans (*86,88,89*).

Recommendations

Guidelines and recommendations from multiple organizations contributed to the recommendations in this report. A limited number of states have specific guidelines or legislation for petting zoo exhibitors and other animal exhibition venues (*1,16,90--92*). However, in the United Kingdom, recommendations to prevent enteric infections at animal exhibitions and agricultural fairs were developed in 1989 (*93*), 1995 (*94*), and 2000 (*95*). In the United States, the American Zoo and Aquarium Association has accreditation standards for reducing risks of animal contact with the public in zoologic parks (*96*). In accordance with the Animal Welfare Act, the USDA Animal Care licenses and inspects certain animal exhibits for humane treatment of animals, but this act is not intended for human health protection. No federal laws address the risk for transmission of pathogens at venues where the public has contact with animals. However, in 2001, CDC issued guidelines to reduce the risk for enteric pathogens (*16*). CDC has also issued recommendations for preventing transmission of *Salmonella* from reptiles to humans (*97*). The Association for Professionals in Infection Control and Epidemiology (APIC) developed guidelines to address risks associated with the use of service animals in health-care settings (*2*).

Opportunities for animal contact with the public occur in various settings. Recommendations provided in this report should be tailored to specific settings, and the report should be incorporated into guidelines and regulations developed at the state or local level. This report should be disseminated to persons who own or manage animals in public settings. State and local human and animal health agencies should make educational materials available to venue operators and other interested persons (*90,91,98*). Incidents of disease transmission or injury should be promptly reported to public health authorities and investigated.

Educational Responsibilities of Venue Operators

Education is essential to reduce risks associated with animal contact in public settings. Animal owners, exhibit operators, and their staff should be educated to make appropriate management decisions. In addition, the public should be educated so that they can weigh the benefits and risks of animal contact and take appropriate measures to

reduce risks. Recommendations include the following:

- **Operator education.** Venue operators should familiarize themselves with the basic risk-reduction recommendations contained in this report. The responsibility of the operator is to apply these recommendations to specific settings and provide basic education to staff and visitors (e.g., using signage, stickers, handouts, or verbal information). State and local agencies as well as county extension agents can serve as resources for operators.
- **Staff education.** Staff at animal contact venues should be trained to reduce the risk for disease and injury associated with animals. Staff who interact with the public should oversee compliance with risk-reduction recommendations and be able to explain them to visitors. Employees should comply with local and state requirements for reporting animal bites, scratches, or other injuries.
- **Individual exhibitor and visitor education.** Venue operators should provide risk-reduction information to individual animal exhibitors, persons arranging school field trips or classroom exhibits, and persons receiving animal exhibition permits or licenses. This information should be provided before the event, if possible, and should also be available to visitors at the entrance to animal contact areas. In addition, these materials should be age- and language-appropriate and ideally should be provided in multiple formats (e.g., signs and handouts).

General Recommendations for Managing Public and Animal Contact

The public's contact with animals should occur in settings where controls are in place to reduce the potential for injuries or disease and increase the probability that exposures will be reported, documented, and handled appropriately. The design of facilities or contact settings should minimize the risk for exposure and facilitate hand washing (Box 1). Certain jurisdictions might choose to establish more restrictive recommendations in areas where animal contact is specifically encouraged (e.g., petting zoos). Requirements for the design of facilities or contact settings might include double barriers to prevent contact with animals or contaminated surfaces except for specified interaction areas. Manure disposal and wastewater runoff should occur in areas where the risk for exposure to pedestrians is eliminated or reduced. Control methods should focus on facility design and management.

Recommendations regarding the management of animals in public settings should address animal areas (where animal contact is possible or encouraged), transition areas, and nonanimal areas (areas in which animals are not permitted, with the exception of service animals) (Figure). Specific guidelines might be necessary for certain settings (e.g., schools [Box 2]). Recommendations for cleaning procedures should be tailored to the specific situation (Appendix).

Animal Areas

Recommendations should be applied both to settings in which animal contact is possible (e.g., county fairs) and settings in which direct animal contact is encouraged (e.g., petting zoos). However, in settings where direct animal contact is encouraged, additional precautions should be taken to reduce the risk for injuries and disease transmission.

For areas where animal contact is possible, design of the entry and exit points for animal contact areas should be planned to facilitate proper visitor flow through transition areas (Figure). These transition areas should include educational information and hand-washing facilities. Fences, gates, or other types of barriers can restrict uncontrolled access to animals and animal contact areas and ensure that visitors enter and exit through transition areas. Animal feed and water should not be accessible to the public. In addition, in buildings where animals live, adequate ventilation is essential for both animals (*99*) and humans.

Food and beverages. No food or beverages should be allowed in animal areas. In addition, smoking, carrying toys,

and use of pacifiers, spill-proof cups ("sippy cups"), and baby bottles should not be permitted in animal areas.

Cleaning procedures. Manure and soiled animal bedding should be removed promptly. Animal waste and specific tools for waste removal (e.g., shovels and pitchforks) should be confined to designated areas restricted from public access. Manure and soiled bedding should not be transported or removed through nonanimal areas or transition areas used by visitors. If this is unavoidable, precautions should be taken to avoid spillage and aerosolization. During events where animal contact is encouraged, periodic disinfection of the venue might reduce the risk for disease transmission during the event.

Supervision of children. Children should be closely supervised during contact with animals to discourage contact with manure and soiled bedding. Hand-to-mouth contact (e.g., thumb-sucking) should also be discouraged. Appropriate hand washing should be required. Additional recommendations for groups at high risk, including children aged <5 years, are outlined in this report (see Additional Recommendations).

Staff. Trained staff should be present in areas where animal contact is permitted to encourage appropriate human-animal interactions, reduce risk for exposure (e.g., by promptly cleaning up wastes), and process reports of injuries and exposures.

Feeding animals. If feeding animals is permitted, only food sold by the venue for that purpose should be allowed. Food sold for animal consumption should not be eaten by humans and should not be provided in containers that can be eaten by persons (e.g., ice cream cones). This policy will reduce the risk for animal bites and the probability of children eating food that has come into contact with animals.

Use of animal areas for public (nonanimal) activities. Zoonotic pathogens can contaminate the environment for substantial periods (*31*). If animal areas need to be used for public events (e.g., weddings and dances), these areas should be cleaned and disinfected, particularly if food and beverages are served. Materials with smooth, impervious surfaces (e.g., steel, plastic, and sealed concrete) are easier to clean than other materials (e.g., wood or dirt floors). Removing organic material (bedding, feed, and manure) before using disinfectants is important. A list of disinfectants is included in this report (Appendix).

Transition Areas Between Animal and Nonanimal Areas

Providing transition areas for visitors to pass through when entering and exiting animal areas is critical. The transition areas between animal and nonanimal areas should be designated as clearly as possible, even if they need to be conceptual rather than physical (Figure). In these areas, information should be provided regarding the 1) prevention of infection and injury and 2) location of hand-washing facilities and instructions for visitors to wash their hands upon exiting.

- Signs informing visitors that they are entering an animal area should be posted at the entrance transition areas. These signs should also instruct visitors not to eat, drink, or place their hands in their mouth while in the animal area. Visitors should be discouraged from taking strollers, baby bottles, pacifiers, food, and beverages into areas where animal contact is encouraged or where contact with animal manure or bedding can occur. Visitor traffic should be controlled to avoid overcrowding the animal area.
- Exit transition areas should be marked with signs instructing the public to wash their hands. Hand-washing stations should be available and accessible to all visitors, including children and persons with disabilities (Box 1).

Nonanimal Areas

Nonanimal areas are areas in which animals are not permitted, with the exception of service animals.

- Food and beverages should be prepared, served, and consumed only in the designated nonanimal areas. Hand-washing facilities should be available where food or beverages are served (Box 1).
- If animals or animal products (e.g., animal pelts, animal waste, and owl pellets) (*100*) are used for educational purposes in nonanimal areas (Box 2), the nonanimal areas should be cleaned (Appendix). Animals and animal products should not be brought into school cafeterias and other food-consumption areas.

Animal Care and Management

The risk for disease or injuries from animal contacts can be reduced by carefully managing the specific animals used for such contacts. These recommendations should be considered for management of animals in contact with the public.

- **Animal care.** Animals should be monitored daily by their owners or caretakers for signs of illness, and they should receive appropriate veterinary care. Ill animals and animals from herds with a recent history of abortion or diarrhea should not be exhibited. Animals should be housed to minimize stress and overcrowding, which can increase shedding of microorganisms. Options to reduce the burden of enteric pathogens need to be evaluated, particularly for animals that are at higher risk and that will be used in venues where animal contact is encouraged.
- **Veterinary care.** Animal owners should retain and use the services of a licensed veterinarian. Vaccination, preventive care, and parasite control appropriate for the species should be provided. Health certificates from a licensed veterinarian should be up-to-date according to local or state requirements for animals in areas where public contact might occur. A herd or flock inspection is a critical component of the health certificate process. Diseases for which animal screening should be considered include TB for elephants (*81--83*) and primates, and Q fever for ruminants in birthing exhibits (*101,102*).
- **Rabies.** All animals should be housed to reduce potential exposures from wild animal rabies reservoirs. Mammals should also be up-to-date on their rabies vaccinations (*103*). These steps are particularly critical in areas where rabies is endemic and in venues where animal contact is encouraged (e.g., petting zoos). Because of the extended incubation period for rabies, unvaccinated mammals should be vaccinated at least 3 months before they have contact with the public. If no licensed rabies vaccine exists for a particular species used in a setting where public contact occurs (e.g., goats, llamas, and camels), consultation with a veterinarian is recommended regarding the use of off-label rabies vaccine. Off-label vaccines cannot provide the same level of assurance as vaccines labeled for use in particular species, but the off-label use of vaccine might decrease the probability of rabies and rabies exposures. Vaccinating slaughter-class animals before displaying them at fairs might not be feasible because of the vaccine withdrawal period that occurs as a result of antibiotics used as preservatives in certain vaccines. Mammals that are too young to be vaccinated at least 3 months before potential human contact should be used only if additional restrictive measures are available to reduce and manage risks. These measures can include using only animals that were born to vaccinated mothers and housed to avoid rabies exposure. Another measure that might be used is to maintain a record of visitors to facilitate locating persons or groups in situations where tracing contacts might be required (e.g., potential rabies exposures).
- **Dangerous animals.** Because of their strength, unpredictability, venom, or the pathogens that they might carry, certain domestic, exotic, or wild animals are not appropriate for use in exhibit settings where a possibility of animal contact exists. Species of primary concern include nonhuman primates (e.g., monkeys and apes) and certain carnivores (e.g., lions, tigers, ocelots, wolves/wolf-hybrids, and bears). In addition, rabies-reservoir species (e.g., bats, raccoons, skunks, foxes, and coyotes) should not be used.
- **Animal births.** If animal births occur, ensure that the public has no contact with animal birthing by-products. The environment should be thoroughly cleaned after each birth, and all waste products should be properly discarded. Holding such events outside is preferable, because if they are held inside, risks for organisms being spread through ventilation systems occur.

Additional Recommendations

- **Populations at high risk.** Groups at high risk for serious infection include persons with waning immunity (e.g., older adults); children aged <5 years; and persons who are cognitively impaired, pregnant, or immunocompromised (e.g., persons with human immunodeficiency virus/acquired immunodeficiency syndrome, without a functioning spleen, or on immunosuppressive therapy). Persons at high risk should take heightened precautions at any animal exhibit. In addition to thorough and frequent hand washing, heightened precautions might include avoiding contact with animals and their environment (e.g., pens, bedding, and manure). Animals of particular concern for transmitting enteric diseases include young ruminants, young poultry, reptiles, amphibians, and ill animals. For young children, risk for exposure might be reduced if they are closely supervised by adults, carried by adults in animal areas, or have animal contact only over a barrier. These measures discourage animals from jumping on or nuzzling children and minimize contact with feces and soiled bedding.
- **Consumption of unpasteurized products.** Unpasteurized dairy products (e.g., milk, cheese, and yogurt) as well as unpasteurized apple cider or juices should not be consumed.
- **Drinking water.** Local public health authorities should inspect drinking water systems before use. Only potable water should be used for human consumption. Back-flow prevention devices should be installed between outlets in livestock areas and water lines supplying other uses on the grounds. If the water supply is from a well, adequate distance should be maintained from possible sources of contamination (e.g., animal-holding areas and manure piles). Maps of the water distribution system should be available for use in identifying potential or actual problems. The use of outdoor hoses should be minimized, and hoses should not be left on the ground. Hoses that are accessible to the public should be labeled "not for human consumption." Operators and managers of animal contact settings in which treated municipal water is not available should consider methods for disinfection of their water supply.

Conclusion

NASPHV recognizes the benefits of human-animal contact. However, infectious diseases, rabies exposures, injuries, and other human health problems have occurred in animal contact settings secondary to human-animal contact. These incidents have substantial medical, public health, legal, and economic effects. The recommendation to wash hands is the single most important prevention step for reducing the risk for disease transmission. The standardized recommendations in this report should be used by public health officials, veterinarians, venue operators, animal exhibitors, and other persons concerned with disease control to minimize risks associated with animals in public settings.

References

1.Be nder JB, Shulman SA. Reports of zoonotic disease outbreaks associated with animal exhibits and availability of recommendations for preventing zoonotic disease transmission from animals to people in such settings. J Am Vet Med Assoc 2004;224:1105--9.
2.Dunca n SL. APIC state-of-the-art report: the implications of service animals in health care settings. Am J Infect Control 2000;28:170--80.
3.S ehulster L, Chinn R, Arduino M, et al. Guidelines for environmental infection control in health-care facilities: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). Chicago, IL: American Society for Healthcare Engineering/American Hospital Association; 2004. Available at http://www.cdc.gov/ncidod/hip/enviro/Enviro_guide_03.pdf.
4.Guay DRP. Pet-assisted therapy in the nursing home setting: potential for zoonosis. Am J Infect Control 2001;29:178--86.
5. LeJeune JT, Davis MA. Outbreaks of zoonotic enteric disease associated with animal exhibits. J Am Vet Med Assoc 2004;224:1440 --5.
6.C happell CL, Okhuysen PC, Sterling CR, DuPont HL. *Cryptosporidium parvum:* intensity of infection and oocyst excretion patterns in healthy volunteers. J Infect Dis 1996;173:232--6.

7.Be ll BP, Goldoft M, Griffin PM, et al. A multistate outbreak of *Escherichia coli* O157:H7-associated bloody diarrhea and hemolytic uremic syndrome from hamburgers: the Washington experience. JAMA 1994;272:1349--53.
8.Ti lden J Jr, Young W, McNamara A-M, et al. A new route of transmission for *Escherichia coli:* infection from dry fermented salami. Am J Public Health 1996;86:1142--5.
9.S hukla R, Slack R, George A, Cheasty T, Rowe B, Seutter J. *Escherichia coli* O157 infection associated with a farm visitor centre. Commun Dis Rep CDR Rev 1995;5:R86--90.
10. Sayers GM, Dillon MC, Connolly E, et al. Cryptosporidiosis in children who visited an open farm. Commun Dis Rep CDR Rev 1996;6:R140--4.
11. Evans MR, Gardner D. Cryptosporidiosis outbreak associated with an educational farm holiday. Commun Dis Rep CDR Rev 1996;6:R50--1.
12. Friedman CR, Torigian C, Shillam PJ, et al. An outbreak of salmonellosis among children attending a reptile exhibit at a zoo. J Pediatr 1998;132:802--7.
13. Pritchard GC, Willshaw GA, Bailey JR, Carson T, Cheasty T. Verocytotoxin-producing *Escherichia coli* O157 on a farm open to the public: outbreak investigation and longitudinal bacteriological study. Vet Rec 2000;147:259--64.
14. Crump JA, Sulka AC, Langer AJ, et al. An outbreak of *Escherichia coli* O157:H7 infections among visitors to a dairy farm. N Engl J Med 2002;347:555--60.
15. Warshawsky B, Gutmanis I, Henry B, et al. An outbreak of *Escherichia coli* O157:H7 related to animal contact at a petting zoo. Can J Infect Dis 2002;13:175--81.
16. CDC. Outbreaks of *Escherichia coli* O157:H7 infections among children associated with farm visits--- Pennsylvania and Washington, 2000. MMWR 2001;50:293--7.
17. Chapman PA, Cornell J, Green C. Infection with verocytotoxin-producing *Escherichia coli* O157 during a visit to an inner city open farm. Epidemiol Infect 2000;125:531--6.
18. Keene WE, deBroekert M, Gillette K. A large *Escherichia coli* O157:H7 outbreak at a county fair [Abstract 55:77]. In: Programs and abstracts of the International Conference on Emerging Infectious Diseases; February 29--March 3, 2004; Atlanta, GA; 2004.
19. CDC. *Salmonella hadar* associated with pet ducklings---Connecticut, Maryland, and Pennsylvania, 1991. MMWR 1992;41:185--7.
20. CDC. *Salmonella* serotype Montevideo infections associated with chicks---Idaho, Washington, and Oregon, spring 1995 and 1996. MMWR 1997;46:237--9.
21. CDC. Salmonellosis associated with chicks and ducklings---Michigan and Missouri, Spring 1999. MMWR 2000;49:297--9.
22. Keen JE, Elder RO. Isolation of shiga-toxigenic *Escherichia coli* O157 from hide surfaces and the oral cavity of finished beef feedlot cattle. J Am Vet Med Assoc 2002;220:756--63.
23. Sharp JCM. Infections associated with milk and dairy products in Europe and North America, 1980--85. Bull World Health Organ 1987;65:397--406.
24. Djuretic T, Wall PG, Nichols G. General outbreaks of infectious intestinal disease associated with milk and dairy products in England and Wales: 1992 to 1996. Commun Dis Rep CDR Rev 1997;7:R41--5.
25. Korlath JA, Osterholm MT, Judy LA, Forfang JC, Robinson RA. A point-source outbreak of campylobacteriosis associated with consumption of raw milk. J Infect Dis 1985;152:592--6.
26. Payne CJI, Petrovic M, Roberts RJ, et al. Vero cytotoxin-producing *Escherichia coli* O157 gastroenteritis in farm visitors, North Wales. Emerg Infect Dis 2003;9:526--30.
27. Anonymous. Waterborne outbreak of gastroenteritis associated with a contaminated municipal water supply, Walkerton, Ontario, May--June 2000. Can Commun Dis Rep 2000;26:170--3.
28. Bopp DJ, Sauders BD, Waring AL, et al. Detection, isolation, and molecular subtyping of *Escherichia coli* O157:H7 and *Campylobacter jejuni* associated with a large waterborne outbreak. J Clin Microbiol 2003;41:174--80.
29. CDC. Outbreak of *Escherichia coli* O157:H7 and *Campylobacter* among attendees of the Washington County Fair---New York, 1999. MMWR 1999;48:803--5.
30. Croft DR, Archer J, Roberts C. Johnson, et al. Outbreak of *Escherichia coli* O157:H7 infections associated

with a pancake breakfast served in a stock pavilion with contaminated livestock bedding---Wisconsin, 2001. In: Programs and abstracts of the 51st Annual Epidemic Intelligence Conference (EIS); April 22--26, 2002; Atlanta, GA; 2002:74--7.
31. Varma JK, Greene KD, Reller ME, et al. An outbreak of *Escherichia coli* O157 infection following exposure to a contaminated building. JAMA 2003;290:2709--12.
32. Kudva IT, Blanch K, Hovde CJ. Analysis of *Escherichia coli* O157:H7 survival in ovine or bovine manure and manure slurry. Appl Environ Microbiol 1998;64:3166--74.
33. LeJeune JT, Besser TE, Hancock DD. Cattle water troughs as reservoirs of *Escherichia coli* O157. Appl Environ Microbiol 2001;67:3053--7.
34. Maule A. Survival of verocytotoxigenic *Escherichia coli* O157 in soil, water and on surfaces. J Appl Microbiol 2000;(Suppl 88):S71--8.
35. Randall LP, Wray C, Davies RH. Survival of verocytotoxin-producing *Escherichia coli* O157 under simulated farm conditions. Vet Rec 1999;145:500--1.
36. Rahn K, Renwick SA, Johnson RP, et al. Persistence of *Escherichia coli* O157:H7 in dairy cattle and the dairy farm environment. Epidemiol Infect 1997;119:251--9.
37. Williams LP Jr, Newell KW. *Salmonella* excretion in joy-riding pigs. Am J Public Health Nations Health 1970;60:926--9.
38. Hurd HS, McKean JD, Wesley IV, Karriker LA. The effect of lairage on *Salmonella* isolation from market swine. J Food Prot 2001;64:939--44.
39. Isaacson RE, Firkins LD, Weigel RM, Zuckermann FA, DiPietro JA. Effect of transportation and feed withdrawal on shedding of *Salmonella typhimurium* among experimentally infected pigs. Am J Vet Res 1999;60:1155--8.
40. Hurd HS, McKean JD, Griffith RW, Wesley IV, Rostagno MH. *Salmonella enterica* infections in market swine with and without transport and holding. Appl Environ Microbiol 2002;68:2376--81.
41. Marg H, Scholz HC, Arnold T, Rosler U, Hensel A. Influence of long-time transportation stress on re-activation of *Salmonella typhimurium* DT104 in experimentally infected pigs. Berl Munch Tierarztl Wochenschr 2001;114:385--8.
42. Corrier DE, Purdy CW, DeLoach JR. Effects of marketing stress on fecal excretion of *Salmonella* spp in feeder calves. Am J Vet Res 1990;51:866--9.
43. US Department of Agriculture. *Escherichia coli* O157 in the United States feedlots. Fort Collins, CO: US Department of Agriculture, Centers for Epidemiology and Animal Health, Animal and Plant Health Inspection Service, Veterinary Services; 2001. Available at http://www.aphis.usda.gov/vs/ceah/ncahs/nahms/feedlot/Feedlot99/FD99ecoli.pdf.
44. Castro-Hermida JA, Gonzalez-Losada YA, Ares-Mazas E. Prevalence of and risk factors involved in the spread of neonatal bovine cryptosporidiosis in Galicia (NW Spain). Vet Parasitol 2002;106:1--10.
45. Garber LP, Wells SJ, Hancock DD, et al. Risk factors for fecal shedding of *Escherichia coli* O157:H7 in dairy calves. J Am Vet Med Assoc 1995;207:46--9.
46. Hancock DD, Besser TE, Kinsel ML, Tarr PI, Rice DH, Paros MG. The prevalence of *Escherichia coli* O157.H7 in dairy and beef cattle in Washington State. Epidemiol Infect 1994;113:199--207.
47. Hancock DD, Besser TE, Rice DH, Herriott DE, Tarr PI. A longitudinal study of *Escherichia coli* O157 in fourteen cattle herds. Epidemiol Infect 1997;118:193--5.
48. US Department of Agriculture. *Salmonella* in United States feedlots. Fort Collins, CO: US Department of Agriculture, Centers for Epidemiology and Animal Health, Animal and Plant Health Inspection Service, Veterinary Services; 2001. Available at http://www.aphis.usda.gov/vs/ceah/ncahs/nahms/feedlot/Feedlot99/FD99salmonella.pdf.
49. Crump JA, Braden CR, Dey ME, et al. Outbreaks of *Escherichia coli* O157 infections at multiple county agricultural fairs: a hazard of mixing cattle, concession stands and children. Epidemiol Infect 2003;131:1055--62.
50. Smith KE, Stenzel SA, Bender JB, et al. Outbreaks of enteric infections caused by multiple pathogens associated with calves at a farm day camp. Ped Infect Dis J 2004;23:1098--104.
51. North Carolina Department of Health and Human Services. *E. coli* outbreak. Raleigh, NC: North Carolina

Department of Health and Human Services; 2004. Available at http://www.dhhs.state.nc.us/docs/ecoli.htm.
52. Kassenborg HD, Hedberg CW, Hoekstra M, et al. Farm visits and undercooked hamburgers as major risk factors for sporadic *Escherichia coli* O157:H7 infection: data from a case-control study in 5 FoodNet sites. Clin Infect Dis 2004;38(Suppl 3):S271--8.
53. O'Brien SJ, Adak GK, Gilham C. Contact with farming environment as a major risk factor for Shiga toxin (Vero cytotoxin)-producing *Escherichia coli* O157 infection in humans. Emerg Infect Dis 2001;7:1049--51.
54. Haack JP, Jelacic S, Besser TE, et al. *Escherichia coli* O157 exposure in Wyoming and Seattle: serologic evidence of rural risk. Emerg Infect Dis 2003;9:1226--31.
55. Soderlund D, Smith K, Bender J, Hedberg C. An epidemiologic investigation of cryptosporidiosis in Minnesota. In: Programs and abstracts of the International Conference on Emerging Infectious Diseases; July 16--19, 2000, Atlanta, GA; 2000:148.
56. Roy SL, DeLong SM, Stenzel SA, et al. Risk factors for sporadic cryptosporidiosis among immunocompetent persons in the United States from 1999 to 2001. J Clin Microbiol 2004;42:2944--51.
57. Hunter PR, Hughes S, Woodhouse S, et al. Sporadic cryptosporidiosis case-control study with genotyping. Emerg Infect Dis 2004;10:1241--9.
58. Friedman CR, Hoekstra RM, Samuel M, et al. Risk factors for sporadic *Campylobacter* infection in the United States: a case-control study in FoodNet sites. Clin Infect Dis 2004;38(Suppl 3):S285--96.
59. Belongia EA, Chyou P-H, Greenlee RT, Perez-Perez G, Bibb WF, DeVries EO. Diarrhea incidence and farm-related risk factors for *Escherichia coli* O157:H7 and *Campylobacter jejuni* antibodies among rural children. J Infect Dis 2003;187:1460--8.
60. American Academy of Allergy Asthma and Immunology. Executive summary report, 1998. Milwaukee, WI: Task Force on Allergic Disorders, 1998.
61. Bardana EJ Jr. What characterizes allergic asthma? Ann Allergy 1992;68:371--3.
62. Lincoln TA, Bolton NE, Garrett AS Jr. Occupational allergy to animal dander and sera. J Occup Med 1974;16:465--9.
63. CDC. Mass treatment of humans exposed to rabies---New Hampshire, 1994. MMWR 1995;44:484--6.
64. Chang H-GH, Eidson M, Noonan-Toly C, et al. Public health impact of reemergence of rabies, New York. Emerg Infect Dis 2002;8:909--13.
65. CDC. Public health response to a potentially rabid bear cub---Iowa, 1999. MMWR 1999;48:971--3.
66. CDC. Multiple human exposures to a rabid bear cub at a petting zoo and barnwarming---Iowa, August 1999. MMWR 1999;48:761.
67. CDC. Fatal Cercopithecine herpesvirus 1 (B virus) infection following a mucocutaneous exposure and interim recommendations for worker protection. MMWR 1998;47:1073--6, 1083.
68. Cohen JI, Davenport DS, Stewart JA, et al. Recommendations for prevention of and therapy for exposure to B virus (*Cercopithecine herpesvirus* 1). Clin Infect Dis 2002;35:1191--203.
69. Hullinger GA, Cole JR Jr, Elvinger F, Stewart RL. Dermatophytosis in show lambs in the United States. Veterinary Dermatol 1999;10:73--6.
70. Scott WA. Ringworm outbreak [Letter]. Vet Rec 1986;118:342.
71. Stover J, Dolensek EP, Basford S, Beheny J. Contagious ecthyma in a children's Zoo. J Zoo An Med 1986;17:115--6.
72. Marennikova SS, Maltseva NN, Korneeva VI, Garanina NM. Outbreak of pox disease among carnivora (felidae) and edentata. J Infect Dis 1977;135:358--66.
73. Kile JC, Fleishchauer AT, Kuehnert MJ, et al. Transmission of monkeypox among exposed daycare attendees: Indiana, 2003 [Abstract 51:132]. In: Programs and abstracts of the International Conference on Emerging Infectious Diseases; February 29--March 3; Atlanta, GA; 2004.
74. CDC. Update: Multistate outbreak of monkeypox---Illinois, Indiana, Kansas, Missouri, Ohio, and Wisconsin, 2003. MMWR 2003;52:642--6.
75. Angarano DW, Parish LC. Comparative dermatology: parasitic disorders. Clin Dermatol 1994;12:543--50.
76. Arlian LG. Biology, host relations, and epidemiology of *Sarcoptes scabiei*. Annu Rev Entomol 1989;34:139--61.
77. Scott DW, Horn RT Jr. Zoonotic dermatoses of dogs and cats. Vet Clin North Am Small Anim Pract

1987;17:117--44.
78. Molina CP, Ogburn J, Adegboyega P. Infection by *Dipylidium caninum* in an infant. Arch Pathol Lab Med 2003;127:e157--9.
79. Currier RW 2nd, Kinzer GM, DeShields E. *Dipylidium caninum* infection in a 14-month-old child. South Med J 1973;66:1060--2.
80. Schantz PM. Toxocara larva migrans now. Am J Trop Med Hyg 1989;41(Suppl 3):21--34.
81. Michalak K, Austin C, Diesel S, Bacon JM, Zimmerman P, Maslow JN. *Mycobacterium tuberculosis* infection as a zoonotic disease: transmission between humans and elephants. Emerg Infect Dis 1998;4:283--7.
82. Stetter MD, Mikota SK, Gutter AF, et al. Epizootic of *Mycobacterium bovis* in a zoologic park. J Am Vet Med Assoc 1995;207:1618--21.
83. US National Tuberculosis Working Group for Zoo and Wildlife Species. Guidelines for the control of tuberculosis in elephants, 2003. Riverdale, MD: US National Tuberculosis Working Group for Zoo and Wildlife Species; 2003. Available at http://www.aphis.usda.gov/ac/TBGuidelines2003.pdf.
84. Heymann DL, ed. Control of communicable diseases manual. 18th edition. Washington, DC: American Public Health Association; 2004.
85. Milford F, Vibien A, Lambert L, Morin M, Petit G, Trottier J. Large Q-fever outbreak related to exposure to petting zoos in two shopping malls. Programs and abstracts of the 51st Annual Conference on Diseases in Nature Transmissible to Man; June 2001; Austin. TX, 2001.
86. Smith KA, Bradley KK, Stobierski MG, Tengelsen LA. Compendium of measures to control Chlamydophila pssitaci (formerly Chlamydia psittaci) infection among humans (psittacosis) and pet birds, 2005. J Am Vet Med Assoc 2005;226:532--9.
87. Christensen AL, Jarlov JO, Ingeberg S. The risk of ornithosis among the staff of Copenhagen Zoo [Danish]. Ugeskr Laeger 1990;152:818--20.
88. Hyde SR, Benirschke K. Gestational psittacosis: case report and literature review. Mod Pathol 1997;10:602--7.
89. Eidson M. Psittacosis/avian chlamydiosis. J Am Vet Med Assoc 2002;221:1710--12.
90. Washington State Department of Health. Recommendations to reduce the risk of disease transmission from animals to humans at petting zoos, fairs and other animal exhibits. Olympia, WA: Washington State Department of Health, Office of Environmental Health and Safety, 2001. Available at http://www.doh.wa.gov/ehp/ts/Zoo/RecommendationsPettingZoo.pdf.
91. Commonwealth of Massachusetts Department of Public Health. Recommendations for petting zoos, petting farms, animal fairs, and other events and exhibits where contact between animals and people is permitted. Boston, MA: Commonwealth of Massachusetts Department of Public Health, Bureau of Communicable Disease Control; 2004. Available at http://www.mass.gov/dph/cdc/epii/rabies/petzoo.htm.
92. Animal Exhibition Sanitation Act 211 of 2002. Pennsylvania Bureau of Animal Health and Diagnostic Services. (May 6, 2002). Available at http://www.agriculture.state.pa.us/animalhealth/lib/animalhealth/sb1325p1990-e.coli._act_211_of_2002.pdf.
93. Casemore D. Educational farm visits and associated infection hazards. Commun Dis Rep CDR Rev 1989;19:3.
94. Dawson A, Griffin R, Fleetwood A, Barrett NJ. Farm visits and zoonoses. Commun Dis Rep CDR Rev 1995;5:R81--6.
95. Warshawsky B, Henry B, Gutmanis I, et al. An *E. coli* O157:H7 outbreak associated with an animal exhibit: Middlesex-London Health Unit Investigation and recommendations---executive summary. Middlesex, London, Ontario, Canada: Middlesex-London Health Unit; 1999. Available at http://www.healthunit.com/index.asp?mode=article&lang=english&articleID=10173&rank=380.
96. American Zoo and Aquarium Association. Guide to accreditation of zoological parks and aquariums (and accreditation standards). Silverspring, MD: American Zoo and Aquarium Association; 2005. Available at http://www.aza.org/Accreditation/Documents/AccredGuide.pdf.
97. CDC. Reptile-associated salmonellosis---selected states, 1998--2002. MMWR 2003;52:1206--9.
98. National Center for Infectious Diseases. Healthy pets healthy people. Atlanta, GA: US Department of Health and Human Services, CDC, National Center for Infectious Diseases; 2004. Available at

http://www.cdc.gov/healthypets.
99. Midwest Plan Service. Heating, cooling and tempering air for livestock housing. Ames, IA: Iowa State University; 1990.
100. Anderson F, Medus C, Leano F, Adams J, Smith K. Outbreaks of salmonellosis at elementary schools associated with dissection of owl pellets. Programs and abstracts of the International Conference on Emerging Infectious Diseases; March 24--27; Atlanta, GA; 2002:118.
101. McQuiston JH, Childs JE, Thompson HA. Q fever. J Am Vet Med Assoc 2002;221:796--9.
102. Ross C, Morrow PS. Q fever: an issue in occupational health & safety? An overview of the methods of control and the effects of *Coxiella burnetii* on the human host. J R Soc Health 1994;114:151--2.
103. CDC. Compendium of animal rabies prevention and control, 2004. MMWR 2004;53(No. RR-9):1--8.

* M. Eidson, DVM, New York State Department of Health, personal communication, 2003. J.B. Bender, DVM, University of Minnesota, personal communication, 2003. M.T. Jay-Russell, DVM, California Department of Health, personal communication, 2003. G.L. Swinger, DVM, Tennessee Department of Health, personal communication, 2003.

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Box 1

BOX 1. Hand-washing recommendations to reduce disease transmission from animals in public settings

Hand washing is the single most important prevention step for reducing disease transmission.

How to Wash Hands

1. Wet hands with running water; place soap in palms; rub together to make a lather; scrub hands vigorously for 20 seconds; rinse soap off hands; then dry hands with a disposable towel.
2. If possible, turn off the faucet by using a disposable towel.
3. Assist young children with washing their hands.

Hand-Washing Facilities or Stations

- Hand-washing facilities should be accessible and sufficient for the maximum anticipated attendance, and configured for use by children, adults, and those with disabilities.
- Hands should always be washed after leaving animal areas and before eating or drinking.
- Hand-washing stations should be conveniently located between animal and nonanimal areas and in food concession areas.
- Maintenance should include routine cleaning and restocking of towels and soap.
- Running water should be of sufficient volume and pressure to remove soil from hands. Volume and pressure might be substantially reduced if the water supply is furnished from a holding tank. Therefore, a permanent pressured water supply is preferable.
- The hand-washing unit should be designed so that both hands are free for hand washing.
- Hot water is preferable, but if the hand-washing stations are supplied with only cold water, a soap that emulsifies easily in cold water should be provided.
- Communal basins, where water is used by more than one person, do not constitute adequate hand-washing facilities.

Hand-Washing Agents

- Liquid soap dispensed by a hand or foot pump is recommended.
- Alcohol-based hand-sanitizers are effective against multiple common disease agents (e.g., *Escherichia coli*, *Salmonella*, and *Campylobacter*) when soap and water are not available. However, they are ineffective against certain organisms (i.e., bacterial spores, *Cryptosporidium*, and certain viruses).
- Hand-sanitizers are less effective if hands are visibly soiled. Therefore, visible contamination and dirt should be removed to the extent possible before using hand-sanitizers.

Hand-Washing Signs

At venues where human-animal contact occurs, signs regarding proper hand-washing practices are critical to reduce disease transmission.

- Signs that are reminders to wash hands should be posted at exits from animal areas.
- Signs should direct visitors and animal handlers to hand-washing stations.
- Signs with proper hand-washing instructions should be posted at hand-washing stations and restrooms to encourage proper practices.
- Hand-washing signs should be placed in food concession areas.

Example of a Hand-Washing Sign

Directions for Washing Hands

How

- Wet hands with running water
- Place soap into palms
- Rub together to make a lather
- Scrub hands vigorously for 20 seconds
- Rinse soap off of hands
- Dry hands

When

- After going to the toilet
- After exiting animal areas
- Before eating
- Before preparing foods

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Box 2

BOX 2. Guidelines for visiting and resident animals in schools

Animals are effective and valuable teaching aids, but safeguards are required to reduce the risk for infection and injury. These abbreviated recommendations are based on guidelines developed by the Alabama Department of Public Health* and the Kansas Department of Health and Environment.† Recommendations are also available from the National Science Teachers Association§ and the National Association of Biology Teachers.¶

General Guidelines for School Settings**

- Wash hands after contact with animals, animal products, or their environment.
- Supervise human-animal contact, particularly for children aged <5 years.
- Handle and house animals humanely.
- Display animals in enclosed cages or under appropriate restraint.
- Designate areas for animal contact.
- Do not allow animals to roam or fly free.
- Do not allow animals in areas where food or drink are consumed.
- Clean and disinfect all areas where animals have been present. This task should not be performed by children aged <5 years. Children aged ≥5 years should only perform this task while supervised by an adult, ideally when children aged <5 years are not present.
- Obtain a certificate of veterinary inspection for visiting animals.
- Administer rabies vaccine to mammals, as appropriate.
- Keep animals clean and free of intestinal parasites, fleas, ticks, mites, and lice.
- Consult with parents to determine special considerations needed for children who are immunocompromised, who have allergies, or who have asthma.

Animal-Specific Guidelines

- Fish — Use disposable gloves when cleaning aquariums, and do not dispose of aquarium water in sinks used for food preparation or for obtaining drinking water.
- Nonpsittacine birds — See General Guidelines.
- Psittacine birds (e.g., parrots, parakeets, and cockatiels) — Consult the psittacosis compendium,†† and seek veterinary advice. Ensure that staff clean cages when children are not present. Use birds treated or testing negative for psittacosis (chlamydiosis).
- Domestic dogs, cats, rabbits, and rodents (e.g., mice, rats, hamsters, gerbils, guinea pigs, and chinchillas) — See General Guidelines.
- Baby chicks and ducks — To prevent *Salmonella* or *Campylobacter* infection, children aged <5 years should not have direct contact with baby chicks and ducks.
- Reptiles (including turtles, lizards, and nonvenomous snakes) and amphibians — To prevent *Salmonella* infection, children aged <5 years should not have direct contact with reptiles.
- Ferrets — To prevent children aged <5 years from being bitten, they should not have direct contact with ferrets.
- Farm animals — See General Guidelines. Certain animals (e.g., young ruminants and young poultry) excrete *E. coli* O157:H7, *Salmonella*, *Campylobacter*, and *Cryptosporidium* intermittently and in substantial numbers; therefore, meticulous attention to personal hygiene is essential or these animals might not be appropriate in some settings (e.g., particularly for children aged <5 years).

Animals Not Recommended in School Settings

- Wild or exotic animals (e.g., lions, tigers, ocelots, and bears).
- Nonhuman primates (e.g., monkeys and apes).
- Mammals at higher risk for transmitting rabies (e.g., bats, raccoons, skunks, foxes, and coyotes).
- Wolf-dog hybrids.
- Aggressive or unpredictable animals, wild or domestic.
- Stray animals with unknown health and vaccination history.
- Venomous or toxin-producing spiders, insects, reptiles, and amphibians.

* W.B. Johnson, DVM, Alabama Department of Public Health, personal communication, 2002.
† Hansen GR. Animals in Kansas schools: guidelines for visiting and resident pets. Topeka, KA: Kansas Department of Health and Environment; 2004. Available at http://www.kdhe.state.ks.us/pdf/hef/ab1007.pdf.
§ National Science Teachers Association. Standards for Science Teacher Preparation. Arlington, VA: National Science Teachers Association; 2003. Available at http://www.nsta.org/main/pdfs/NSTAstandards2003.pdf.
¶ National Association of Biology Teachers. The use of animals in biology education. Reston, VA: National Association of Biology Teachers; 1995. Available at http://www.nabt.org/sub/position_statements/animals.asp.
** Guide, hearing, or other service animals and law enforcement animals can be used when they are under the control of a person familiar with the specific animal and in accordance with recommendations from the sponsoring organizations.
†† Smith KA, Bradley KK, Stobierski MG, Tengelsen LA. Compendium of measures to control Chlamydophila psittaci (formerly Chlamydia psittaci) infection among humans (psittacosis) and pet birds, 2005. J Am Vet Med Assoc 2005;226:532–9.

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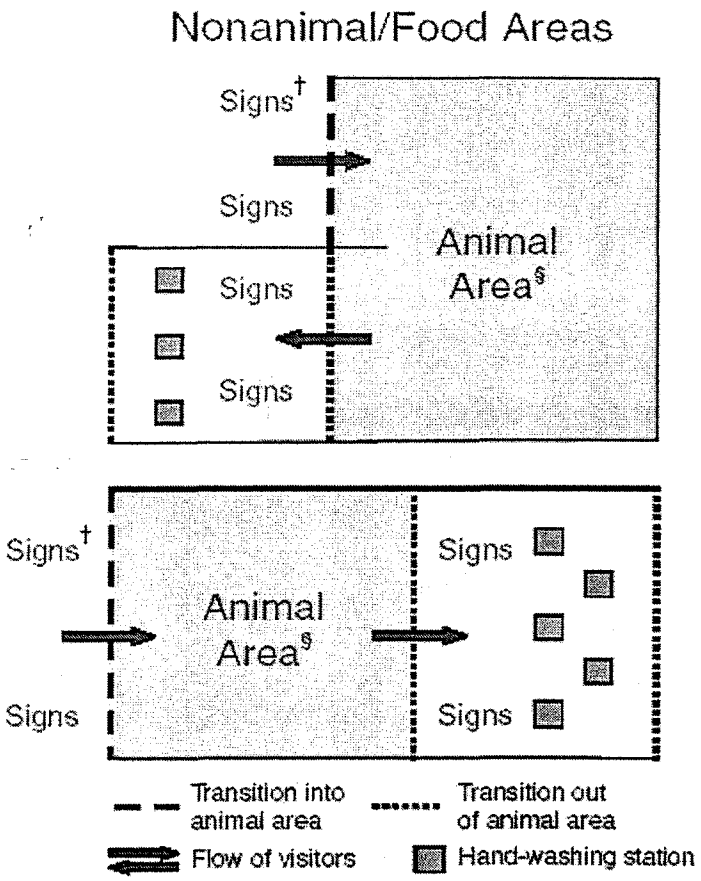
Figure

FIGURE. Examples of designs for animal contact settings, including clearly designated animal areas, nonanimal areas,* and transition areas with hand-washing stations and signage



* Nonanimal areas — Areas in which animals are not permitted, except for service animals (e.g., guide dogs). Food and beverages should be prepared, served, and consumed only in the designated nonanimal areas.
† Signs should be in different formats depending on the audience (e.g., children and persons who do not speak English). Nonwritten information (e.g., verbal instructions and videos) can also be used.
§ Animal area — Areas in which animal contact is possible (e.g., county fairs) or is encouraged (e.g., petting zoos).

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**Questions or messages regarding errors in formatting should be addressed to mmwrq@cdc.gov.

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